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ABSTRACT

This paper studies the semantic properties of a reciprocal construction in Taiwanese. Specific focus is on the real-world situations that this reciprocal construction may encode. First, the syntactic properties of the reciprocal construction "xiou"-V in Taiwanese, which are different from these in English, are analyzed. Next, various reciprocal situations are discussed and compared with those of English examples. In addition, general schema reciprocals proposed by Langendoen (1978) are reviewed. A new schema, based on Oehrle's Austinian pluralities, is proposed to accommodate all types of reciprocal situations. (JL)

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THE LOGIC OF RECIPROCITY REVISITED:
On the Interpretations of a Reciprocal Construction in Taiwanese*[1]

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Abstract: In this paper, we study the semantic properties of a reciprocal construction in Taiwanese. We particularly focus on the real-world situations that this reciprocal construction may encode. In this study, we not only find that the types of predicates are closely related to the interpretations of the reciprocal and that the semantics of the reciprocal is cross-linguistically similar by comparison with studies of reciprocals in English, but also make some discoveries that have never been discussed before. In addition, we review the general schema of reciprocals proposed by Langendoen (1978) and show its inadequacies. Then, based on Oehrle's (to appear) Austinian pluralities, we propose a new schema to accommodate all types of reciprocal situations.

Introduction

The purpose of this study is to investigate the semantic properties of a reciprocal construction in Taiwanese--*xiou*-V. We particularly focus on the real-world situations[2] that this reciprocal construction may encode. In this study, we not only find that the types of predicates are closely related to the interpretations of the reciprocal and that the semantics of the reciprocal is cross-linguistically similar by comparison with studies of reciprocals in English, but also make some new discoveries that have never been discussed in the previous studies of reciprocals. In addition, we review the general schema of reciprocals proposed by Langendoen (1978) and show its inadequacies. Then, based on Oehrle's (to appear) Austinian pluralities, we propose a new schema to accommodate all types of reciprocal situations.

The organization of this paper is as follows. First, we briefly discuss the syntactic properties of the reciprocal construction *xiou*-V in Taiwanese, which are different from those in English. Then, we discuss the various reciprocal situations that *xiou*-V may encode and compare them with those of the English examples. At the same time, we review the general schema of reciprocals proposed by Langendoen (1978) and show its inadequacies. Following that, we propose a new schema based on Oehrle's (to appear) Austinian pluralities to accommodate all types of reciprocal situations.

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Syntactic Properties

The syntactic properties of the reciprocal construction *xiou*-V in Taiwanese are different from those of the reciprocal constructions in English in that English uses reciprocal pronouns such as *each other* to express reciprocal relations while *xiou*-V uses reciprocal verb construction for the same purpose. *Xiou*-V is composed of a verb and a prefix *xiou-*, which roughly means 'reciprocally'. The verb in *xiou*-V is normally a transitive verb,[3] which can be a stative verb or an action verb. After combining with *xiou-*, the transitive verb becomes intransitive, as shown in (1).

1) a. I pa gua.
he hit me
'He hit me.'

b. I ga gua xiou-pa.
he and/with me REC-hit
'He and I hit each other; he and I fought.'

c. *I xiou-pa gua.
he REC-hit me

(1a) is a normal transitive sentence, in which the verb *pa* 'hit' takes an object *gua* 'me'. The verb becomes intransitive when it becomes the reciprocal verb *xiou-pa* 'REC-hit', as in (1b). (1c) is ungrammatical because *xiou-pa* should be intransitive but it takes an object *gua*.

Besides, the subject of *xiou*-V must be plural. For example, the subject in (1b) is a conjoined plural subject. But in (2), the subject is singular and the sentence is ungrammatical, which is the same in English reciprocals.

2) *I xiou-pa.
he REC-hit
*'He hit each other.'

In fact, the claim that the subject of the reciprocal construction *xiou*-V must be plural is too strong because the status of *ga* (e.g. in (1b)) is not clear. *Ga* may be a conjunction like *and* in English or a preposition like *with*. For example, (3a) and (3b) are both grammatical. If we assume that a modal verb cannot intervene between elements of a conjoined subject, the *ga* in (3b) is more like a preposition than a conjunction.

3) a. I ga gua e xiou-pa.
he and/with I will REC-hit
'He and I will hit each other; he and I will fight.'

b. I e ga gua xiou-pa.
he will with me REC-hit
'He will fight with me.'

In addition, some *xiou*-V's can have a singular subject sometimes, as in (4a). (4a) is syntactically well-formed but semantically incomplete. The complex verb *xiou-kuan* 'REC-look-at' is used for matchmaking occasions. On such occasions, the participants must be more than one, but the subject in (4a) is singular. This is the reason why the question in (4b) is asked. The *ga* in (4b) is apparently a preposition.

4) a. I zanga ki xiou-kuan
he yesterday go REC-look-at
'He went to see someone yesterday (on a matchmaking occasion).'

b. Ga xiang xiou-kuan?
with who REC-look-at
'See whom?'

Since the focus of this study is the semantic properties of the reciprocal instead of the syntactic properties, we would like to regard this plurality requirement as a semantic requirement: the subject of the reciprocal construction *xiou*-V in Taiwanese must be semantically plural. The term 'subject' here should not be taken as strictly a syntactic subject. How this phenomenon is analyzed in a syntactic study is beyond the scope of this paper.

Semantic Properties

As noted by Lichtenberk (1985), the reciprocal construction in many languages may encode more than one type of real-world situation. The situations represented by the reciprocal construction in English have been discussed in Fiengo & Lasnik (1973) and Langendoen (1978), among others. Langendoen further proposed a general schema for the truth conditions of the reciprocals, namely weak reciprocity (WR) and weak reciprocity for subsets (WRS), as given in (5a) and (5b). (5a) is a schema for relations (R) between atomic elements of a set A and (5b) is a generalization of the notion of WR to relations between subsets of A. (5a") is a situation described by (5a') and it satisfies WR. (5b") is a situation described by (5b') and it satisfies WRS.

5) a. Weak Reciprocity (WR)
$(\forall x \in A)(\exists y,z \in A)(x \neq y \wedge x \neq z \wedge xRy \wedge zRx)$

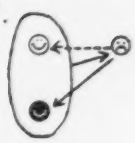
a'. They scratched one another's back.

a". ☺ → ☹
↑ ↙
●

b. Weak Reciprocity for Subsets (WRS)
$(\forall x \in A)(\exists X_1,X_2,Y \neq \varnothing,Z \neq \varnothing \subseteq A)(x \in X_1 \wedge x \in X_2 \wedge x \notin Y \wedge x \notin Z \wedge X_1RY \wedge ZRX_2)$

b'. They released one another.

b".



In this section, we are going to discuss the various situations that the reciprocal construction *xiou*-V in Taiwanese may encode.[4] *Xiou*-V can be divided into five semantic types according to their corresponding real-world situations. The first type consists of stative verbs and denotes strong reciprocal situations. The second type consists of action verbs and expresses weak reciprocal situations. The third type consists of verbs such as *xiou-sua* 'REC-succeed' in Taiwanese and *stack* in English. *Xiou*-$V_{succeed}$ is used as the label of this type in the following discussion. The fourth type is a new discovery. It consists of verbs such as *xiou-dan* 'REC-wait-for' in Taiwanese and *wait for* in English. *Xiou*-V_{wait} is used for this type in the discussion. The last type is a mixed type of *xiou*-$V_{succeed}$ and *xiou*-V_{wait}. It consists of verbs such as *xiou-tah* 'REC-pile' and *xiou-jyu* 'REC-ask' in Taiwanese and *pile up* and *follow* in English. *Xiou*-V_{pile} is used for this type in the discussion. These five types are discussed in the following five subsections respectively. In the discussion, we not only show that the types of situations that the reciprocal encodes are closely related to the types of predicates, as also noticed by Fiengo & Lasnik (1973), we also show that the semantic properties of the reciprocal construction are cross-linguistically similar, and that the WR/WRS schema proposed by Langendoen in (5a) and (5b) cannot accommodate all the cases of reciprocal situations in Taiwanese as well as in English.

Xiou-V_{state} *Xiou*-V_{state} is the first semantic type of *xiou*-V. It consists of stative verbs. Examples are given in (6). The situations denoted by the reciprocal sentences of this type are strong reciprocal situations, as represented by the schema in (7) from Langendoen (1978).

(6) xiou-bal 'know each other'
xiou-xiang 'resemble'
xiong-ho[5] 'friends to each other'
xiong-ai 'love each other'

7) Strong Reciprocity (SR)
$(\forall x,y \in A)\ (x \neq y \rightarrow xRy)$

In each situation, each participant bears the relation denoted by the predicate to every one else. For example, in (8a), every single member of the group denoted by *in* 'they' must know every other member in the group to satisfy the reciprocal situations, as illustrated in (8b), for instance. (The arrowheads indicate the directions of knowing.) Partitioning the participants into subgroups is not possible, as also noticed by Fiengo & Lasnik (1973).[6,7] A situation in which A and B know each other and C and D know each other but A does not know C and D nor does B, as illustrated in (8c), is not a situation for (8a).

8) a. In u xiou-bal.
they Asp REC-know
'They know each other.'

b.

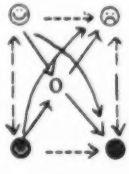
c.

Xiou-V_{action} The second semantic class of the *xiou*-V reciprocal is *xiou*-V_{action}, which consists of action verbs. Examples are given in (9).

9) xiou-keh 'push each other'
xiou-pa 'hit each other, fight'
xiou-tai 'attack each other with knife'
xiou-ma 'scold each other'
xiou-liong 'shout at each other'
xiou-jim 'kiss each other, lip kiss'
xiou-kuan 'look at each other, used on matchmaking occasions'

The relation expressed by this type of reciprocal is WR/WRS given in (5). For example, in (10), if the participants are two, e.g. A and B, the situation would be that A is pushing B and B is pushing A. If the participants are three, e.g. A, B, and C, all the possible situations that can make (10) true are shown in (11a-c). If the number of the participants is five, (11d) is a possible situation for (10), which is a situation distinguishing WR from PIR and others.[8]

10) In li xiou-keh.
they Part. REC-push
'They are pushing each other.'

11) a. b. c. d. 

Xiou-jim 'REC-kiss' and *xiou-kuan* 'REC-look-at' are two special cases in the type of *xiou*-V_{action}. They are used on special occasions and the number of the participants is normally two: *xiou-jim* is used to refer to lip kisses only and *xiou-kuan* is used on matchmaking occasions. But it is also possible that on an occasion of *xiou-kuan*, two men and two women are involved, as in (12). Hence, these two items may be special, but they are not exceptional cases of WR/WRS.

12) Zanga u si-e lang li jia xiou-kuan.
yesterday have four-CL person in here REC-look-at
'Yesterday, there were four people here (e.g. in a romantic restaurant) to look at each other.'

Xiou-$V_{succeed}$ The third semantic type of reciprocal is called 'linear configurationals' in Fiengo & Lasnik (1973) and the 'chaining situations' in Lichtenberk (1985). The relation denoted by the predicate is asymmetric, i.e. if the relation A → B holds, then B → A does not. For example, in (13), if dish A is stacked on top of dish B, dish B cannot be stacked on top of dish A.

13) The dishes are stacked on top of each other.

And the relation denoted by this type of reciprocal holds only between atomic items. That is, the relation illustrated in (14a) is such a relation but that in (14b) is not, and (15a) is a possible situation for (13) but (15b) is not.

14) a. A → B → C...
b. A → (B,C) → (D,E,F) → G ...

15) a. _____/ b. ___/ ___/
_____/ _____/
_____/ _____/

Like *stack* in English, there are examples of chaining situations in Taiwanese. *Xiou-sua* 'REC-succeed' is one example.

As noted in Langendoen (1978), WR/WRS can satisfy an asymmetric, disconnected relation R on an indefinite set A for which the relation is not well-founded, as in (16), but it does not cover the situations that are well-founded, such as (13) and (14a). Hence, WR/WRS is not an adequate schema for *xiou*-$V_{succeed}$.

16) ...→ A → B → C →...

Xiou-V_{wait} The fourth semantic type of reciprocal consists of verbs such as *xiou-dan* 'REC-wait-for' in Taiwanese and *wait for* in English. The peculiarity of this type is that, like *xiou*-$V_{succeed}$, the relation denoted by the predicate is asymmetric and cannot be accommodated by WR/WRS, nor can it be represented by the atomically linearly ordered situation in (14a). For example, (17a) and (17b) may be satisfied by a single situation in which A waits for B and B does not wait for A, as in (18a), or by a situation in which A waits for B and A and B wait for C, as in (18b).[9] But they are not likely a description of a situation in which A waits for B, and A leaves when B arrives, and then B waits for C alone.

17) a. Lan minazai li e qia-tao xiou-dan.
we tomorrow in Part car-head REC-wait
'Let's wait for each other at the station tomorrow.'

b. We will wait for each other at the mall.

18) a. A → B

b. A → B; (A,B) → C

Xiou-V_{pile} The fifth semantic type, *xiou*-V_{pile}, is a mixed type of *xiou*-$V_{succeed}$ and *xiou*-V_{wait}. The relation denoted by the predicate of this type is also asymmetric and may hold between linearly ordered atoms like that of *xiou*-$V_{succeed}$ in (14a) and (15a), or the situations like those denoted by *xiou*-V_{wait} and those in (14b) and (15b) can also meet the requirement. *Xiou-tah* 'REC-pile', *xiou-jyu* 'REC-ask' and *xiou-de* 'REC-follow' are examples of this type from Taiwanese and *pile up* and *follow* are examples from English. For instance, (19a) can be interpreted as that A told B "Let's go to the opera" and then B told C "Let's go to the opera", like (14a), or that A told B "let's go to the opera" and then A and B together told C "Let's go to the opera", like (18b). (19b) is also vague in that it can indicate a situation in which one dish is stacked on top of the other, like (15a), or in which, say, two dishes are stacked on top of the other(s), like (15b). *Pile up* and *follow* in English reciprocal sentences denote the same situations as *xiou-tah* in Taiwanese does.[10]

19) a. Geng xiou-jyu lai kan hi.
we REC-ask come see opera
'We asked each other to come to the opera.'

b. Huai pan-a xiou-tah.
those dish-Part. REC-pile
'The dishes are piled up on top of each other.'

Summary In the discussion above, the situations denoted by the *xiou*-V reciprocal are classified into five types: *xiou*-V_{state}, *xiou*-V_{action}, *xiou*-$V_{succeed}$, *xiou*-V_{wait} and *xiou*-V_{pile}. Different situation types are related to different predicates. These situation types are not unique in Taiwanese. They are also found in English. The general schema WR/WRS proposed by Langendoen (1978) can accommodate the first two types but not the last three. Hence, a new schema is presented and discussed in the following section.

A General Schema

As discussed above, the situations encoded in the reciprocal construction cannot be completely accommodated by the truth conditional schema in Langendeon (1978). A new general schema is needed. Hence, we adopt Oehrle's (to appear) schema of Austinian pluralities for the reciprocal situations with some adjustments, which is discussed in the first subsection. In the second subsection, the application of the general schema to the different semantic types of the reciprocal is discussed. And the third subsection is a brief summary of the discussion.

Oehrle's Schema and the Adjustments Oehrle (to appear) proposes a schema of plurality based on two ideas: the Austinian propositions[11] and the assumption that both individuals and situations constitute domains structured by a sum operation. An Austinian proposition is regarded as about a structured set of situations rather than a single situation, and such a proposition may involve similarly-structured set of individuals as the arguments of the relation involved. The schema of plurality proposed by Oehrle is in (20), where the relation '$\alpha \models \beta$' holds when α is a minimal model of β.

20) $\bigsqcup_{i\in I}(s_i \models (v'(x_i)(y_i)))$
$(\bigsqcup_{i\in I}(x_i)) \models np_1'$
$(\bigsqcup_{i\in I}(y_i)) \models np_2'$

In (20), np_1 and np_2 are plural noun phrases and v is a transitive verb in a sentence np_1 v np_2. The interpretation of each noun phrase is represented as a join of individuals satisfying the interpretive constraints of its component parts and the interpretation of the sentence is represented as a join of situations satisfying the binary relation v' associated with v. These structures are linked with a common index set I, together with indexed indeterminates.

Based on the schema in (20), Oehrle develops the schema in (21) for reciprocals in English by adding some constraints. First, reciprocal pronouns in English such as *each other* cannot be bound by singular noun phrases. This is taken care of by the constraint $x_i \neq y_i$ in the relational schema. Second, in reciprocal sentences, both arguments of the verb (i.e. the subject np_1 and the object *each other* (np_2) for example) have the same interpretation; therefore, $(\bigsqcup_{i\in I}(y_i)) = \bigsqcup_{i\in I}(x_i)$ is required.

21) $\bigsqcup_{i\in I}(s_i \models (v'(x_i)(y_i)) \wedge x_i \neq y_i)$
$(\bigsqcup_{i\in I}(x_i)) \models np_1'$
$(\bigsqcup_{i\in I}(y_i)) = \bigsqcup_{i\in I}(x_i)$

Oehrle's account in (21) is compatible not only with interpretations of the form $(AxA)\backslash\Delta$--the cross-product of the argument interpretation A with itself minus the diagonal Δ of AxA--but also with much weaker relations among the members of the argument interpretation A, as studied by Langendoen (1978). The formulation treats those readings of the reciprocal as special cases of the single, general and simple schema in (21).

However, as pointed out by Langendoen (personal communication), the condition that requires the relation holds of distinct pairs $\langle x_i, y_i \rangle$ in (21) is inadequate for the reciprocals. The condition $x_i \neq y_i$ should be modified to $x_i \cap y_i = \varnothing$, because, for example, (22) can be satisfied by the join of situations in which A hit B, B hit C and C hit A, or by the join of situations in which A and B hit C, B and C hit A, and A and C hit B, etc., but it cannot be satisfied

by the join of situations in which A and B hit B and C, and B and C hit A and B, yet the schema in (21) wrongly predicts that this is a correct set of situations for (22).

22) They (A, B and C) hit each other.

Also, x_i and y_i in (21) should not be null. Therefore, the schema for the reciprocal in (21) is modified as in (23), which is the schema we adopt for all the situations denoted by the reciprocal construction in Taiwanese and English.

23) $\bigsqcup_{\in I}(s_i \models (v'(x_i)(y_i)) \wedge x_i \cap y_i = \varnothing \wedge x_i, y_i \neq \varnothing)$
$(\bigsqcup_{\in I}(x_i)) \models np_1'$
$(\bigsqcup_{\in I}(y_i)) = \bigsqcup_{\in I}(x_i)$

However, in the reciprocal construction *xiou*-V in Taiwanese, there is no object np in the sentence. But this is not a problem because, in English, both arguments of the verb in the reciprocal construction have the same interpretation and only the subject np is relevant in (23). Yet, the item that refers to the participants in the *xiou*-V sentence may not be exactly the subject np as we have discussed previously. For this, the np_1' in (23) should be treated as the interpretation of the semantic subject, e.g. the subject and the np linked by *ga* 'and, with', as in (3a,b).

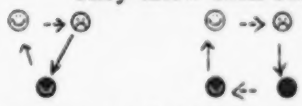
3) a. I ga gua e xiou-pa.
he and/with I will REC-hit
'He and I will hit each other; he and I will fight.'
b. I e ga gua xiou-pa.
he will with me REC-hit
'He will fight with me.'

In the following section, we discuss the application of (23) to the different semantic types of the reciprocal in Taiwanese and English discussed in the previous section.

The Application of the Schema to the Reciprocal Situations As noted by Oehrle himself, the schema can accommodate the reciprocal cases discussed in Langendoen (1978), i.e. cases of WR/WRS, but it cannot accommodate cases like the chaining situations, i.e. cases of *xiou*-$V_{succeed}$. Also, as we have discussed in the previous section, cases such as *xiou*-V_{wait} and *xiou*-V_{pile} cannot be accommodated by WR/WRS either, nor can they be accommodated by the schema in (23). The common characteristic of these three types is that the relation that the verb denotes is asymmetric. Whereas, the relations denoted by the verbs in *xiou*-V_{action} and *xiou*-V_{state} are reversible. As suggested by Oehrle (to appear: 3), 'reasoning about particular cases depends on properties of the relation v''; therefore, in order for the schema in (23) to be able to apply to all the cases of the reciprocal situations, we have to give different types of predicates in the reciprocal construction different relational properties and constraints.

As discussed previously, the *xiou*-V_{state} type exhibits strong reciprocity. It requires that the relation v' corresponding to the stative verb holds symmetrically between atomic elements. But the schema in (23) is too weak to provide the *xiou*-V_{state} reciprocal with correct situations. For example, the situations illustrated in (24) satisfy the relational schema in (23) but they are not situations described by sentence (8a).

8) a. In u xiou-bal.
they Asp REC-know
'They know each other.'

24) 

Therefore, to guarantee that the symmetric relation holds, an extra condition (25) is needed in addition to the condition that x_i and y_i must be atomic:[12]

25) If v'(x,y) is true, v'(y,x) must also be true:
, $v'(x,y) \Rightarrow v'(y,x)$
(v' is the binary relation denoted by a V_{state}.)

(25) is not an implication rule. It is interpreted as: if a situation s_1 that satisfies v'(x,y) is found, another situation s_2 that satisfies v'(y,x) must also be found. For example, in (8a), if A knows B, then B must also know A to satisfy the situation described by the sentence; if A knows B but B does not know A, (25) is violated and it is not a legitimate situation for (8a).

Even with (25), the schema in (23) is still too weak for the *xiou*-V_{state} reciprocal because it wrongly allows situations such as (26a) and (26b) to be legitimate situations of (8a). To prevent this from happening, another condition (27) is needed.

26) a.
b.

27) If v'(x,y) and v'(y,z) are true, v'(x,z) must also be true:
$v'(x,y)$ & $v'(y,z) \Rightarrow v'(x,z)$
(v' is the binary relation denoted by a V_{state}.)

Like (25), (27) is not an implication rule nor a transitive rule. It is interpreted as: whenever an s_1 that satisfies v'(x,y) and an s_2 that satisfies v'(y,z) are found, an s_3 that satisfies v'(x,z) must also be found. For example, if A knows B and B knows C, A must also know C to satisfy the situation described by (8a).

Contrary to *xiou*-V_{state}, *xiou*-V_{action} exhibits WR/WRS. No extra condition needs to be added to (23).

Now we come to the types *xiou*-$V_{succeed}$, *xiou*-V_{wait} and *xiou*-V_{pile}. As noted above, the relation denoted by these predicates is asymmetric. And that is what makes them unable to be accommodated to the schema in (23). If we treat the

binary relation v' associated with the predicates $V_{succeed}$, V_{wait} and V_{pile} as being in the relation of V-*ing*, following Langendoen's suggestion (personal communication), the problem can be solved. That is, if the verb is *follow*, v' in (23) can mean either 'following' or 'being followed'. For example, when A follows B, it is treated as A and B entering into a 'follow' relation; consequently, v'(A)(B) is true and v'(B)(A) is also true. The rule is in (28).

28) If v'(x,y) is true, v'(y,x) is automatically true:
$v'(x,y) \rightarrow v'(y,x)$
(v' is the binary relation denoted by a $V_{succeed/wait/pile}$.)

However, the three types of reciprocals *xiou*-$V_{succeed}$, *xiou*-V_{wait} and *xiou*-V_{pile} are somewhat different from each other as discussed previously. The relation of *xiou*-$V_{succeed}$ holds only between atomic items, i.e. x_i and y_i in (23) must be atomic; therefore, (29) is needed.

29) $|x_i|, |y_i| = 1$

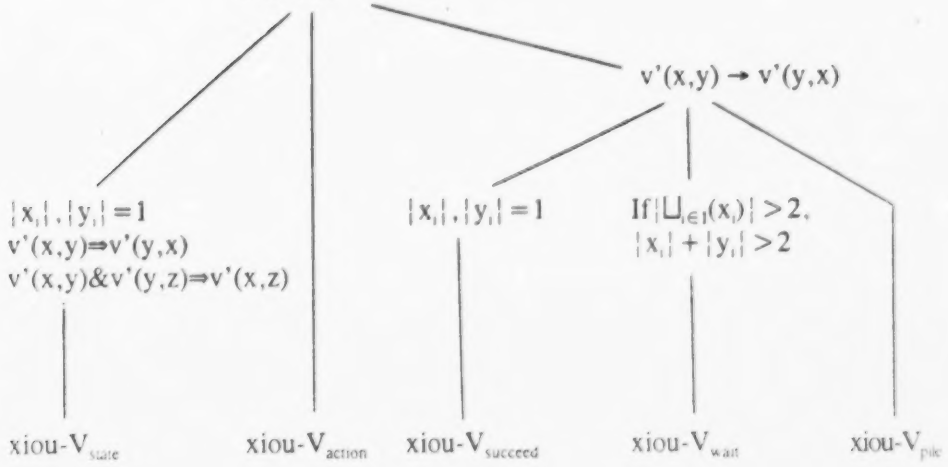
The relation of *xiou*-V_{wait} cannot hold between atomic items if the participants are more than two, i.e. x_i and y_i cannot both be atomic when the participants are more than two; hence, (30) is needed.[13]

30) If $|\sqcup_{i \in I}(x_i)| > 2$, then $|x_i| + |y_i| > 2$

Xiou-V_{pile} is the mixed type of the two, no extra constraint other than (28) is needed to be added to (23).

Summary With the schema in (23) and the different properties of the various types of predicates discussed above, we correctly supply the reciprocal in Taiwanese and English with the corresponding situations. The general schema and the specific conditions for each semantic type of the reciprocal are summarized in (31).

31) $\sqcup_{i\in I}(s_i \models (v'(x_i)(y_i)) \wedge x_i \cap y_i = \varnothing \wedge x_i, y_i \neq \varnothing)$
$(\sqcup_{i\in I}(x_i)) \models np_1'$
$(\sqcup_{i\in I}(y_i)) = \sqcup_{i\in I}(x_i)$



Conclusion

In this paper, we have discussed the semantic properties of the reciprocal *xiou*-V in Taiwanese and classified them into five semantic groups according to their corresponding real-world situations. We have also compared the reciprocal situations in Taiwanese and English and found that the semantic properties of the reciprocal are cross-linguistically similar: the five semantic types of the reciprocal are found both in Taiwanese and English and different predicates in the reciprocal construction may denote different real-world situations, e.g. the difference between *xiou*-V_{state} and *xiou*-V_{action}. In addition, based on Oehrle's (to appear) Austinian pluralities, we have also given the various semantic types of the reciprocal a general schema and specific conditions in order to supply them with correct real-world situations.

The relation between reciprocals and plurals have been well discussed in Langendoen (1978) and Oehrle (to appear), among others. Now the questions that may be aroused by this study of the reciprocal are: Why do different types of predicates denote different reciprocal situations? What principle may underlie the relation between predicates in the reciprocal construction and predicates in general? We will leave them for future research.

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NOTES

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[1] Taiwanese is a variety of South Min (a Chinese dialect), which includes Amoy, Zhangzhou, Quanzhou, and many other dialects spoken in the southern part of Fukien (Min) Province and some part of Kwangtung Province. Some varieties of South Min are spoken by the Chinese in Malaysia, Singapore and other Southeastern Asian countries. The reason that 'Taiwanese' is used as the name of the language in the present study is that it is now the most common name for the language and that the data under study are drawn from the variety spoken in Taiwan, mostly my own dialect.

[2] The term 'situation' has two slightly different meanings in this paper. What we refer to as a situation in the first three sections may be a set of situations referred to by the schema discussed in the fourth section.

[3] *Xiong-ho* 'REC-nice' is a special case of *xiou*-V in that *ho* is an adjective or a non-transitive stative verb that requires a plural subject if the interpretation of *ho* in *xiong-ho* is intended, as shown in (i).

i) a. In jin ho.
they very nice
'They are very nice.'
'They are in good condition.'
'They are good friends.'

b. In jin xiong-ho.
they very REC-nice
'They are friends to each other.'

(ia) is ambiguous. When it means the first and second readings, the subject can be singular. When the third reading is intended, the subject must be plural. (ib) has the same meaning as the third reading of (ia).

[4] Not all cases of *xiou*-V are reciprocals. For example, *xiong-xin* 'believe' is a transitive verb like *believe* in English and has no meaning of any type of reciprocity discussed in this section. *Xiou-pien* 'cheat each other' and *xiou-sang* 'see off' can have a singular subject, as in (i). But when they have certain plural subjects, they are interpreted as reciprocals as in (ii).

i) Li mai xiou-pien.
you(sg.) don't REC-cheat
'You don't cheat (me).'
ii) Lan leng-e m-tang xiou-pien.
we two-CL shouldn't REC-cheat
'We two shouldn't cheat each other.'

My speculation is that some semantic change has been going on. *Xiong-xin* is completely lexicalized and has lost all the meaning of reciprocity, and *xiou-pien* and *xion-sang* have lost part of the meaning of reciprocity.

[5] *Xiong-* is an allomorph of *xiou-*.

[6] One thing to be noted is that when there are natural subgroups of the participants, the subgroups as a whole instead of the members in the subgroups are relevant to the situation in question. For example, (i) indicates that the general relation between the two families is pretty good. This may implicate that the members of the two families have friendly interaction with each other, but this is not what the sentence denotes.

i) In leng-ge jin xiong-ho.
they two-family very REC-nice
'The two families are friendly to each other.'

(ii) is an example from English.

ii) John's grandparents hate one another.

According to Langendoen (1978, footnote 10), (ii) is satisfied by a situation in which John's paternal grandparents hate John's maternal grandparents and vice versa. This seems to be a counterexample to our strong reciprocity analysis of *xiou*-V_{state}. But this may not be a real counterexample since there is a natural grouping of grandparents, namely, paternal and maternal, and in the situation of (ii), the subgroups are treated as whole units and the relation between the individual members inside the subgroups is not relevant. This is only a speculation and further studies on the following issues are needed: the definition of grouping, the causes of grouping (e.g. the context, the natural demarcation, the phrasing of the subject), the accessibility of members inside subgroups, etc.

[7] According to Langendoen (1978), SR is too strong a schema for the stative-verb reciprocal. According to him, (i) can be satisfied by the situation in (ii) but SR would rule (ii) out. Therefore, unlike in Taiwanese, some stative verbs in English need a weaker reciprocal schema (e.g. WR/WRS) than SR.

i) They are similar to one another.
ii) A↔B
↕ ↕
C↔D

[8] In Langendoen (1978), there are six possible truth-conditional schemata for reciprocals. WR and PIR in (i) are two of them.

i) Partitioned Intermediate Reciprocity (PIR)
Let $A = A_1 \cup \ldots \cup A_n$ and $(\forall i,j,\ 1 \leq i,j \leq n)(i \neq j \rightarrow A_i \cap A_j = \varnothing)$ and $(\forall_k, 1 \leq k \leq n)(\text{card } A_k \geq 2)$:
$(\forall i,\ 1 \leq i \leq n)(\forall x,y \in Ai)\{x \neq y \rightarrow$
$[xRy \vee (\exists n > 0)(\exists z_1,\ldots,z_n \in A)(xRz_1 \wedge \ldots \wedge z_nRy)]\}$

When the members of the set A are no more than four, PIR equals WR. When the members are more than four, PIR implies WR but not vice versa. (11d) is a situation of WR but not of PIR.

[9] Note that if the sentence is in past tense, such as (i), the situation may be different. (i) can be satisfied when A waited for B in one corner of the mall while B waited for A in another corner at the same time. But (i) is not likely to be satisfied if the real situation is that A waited for B and not vice versa.

(i) We (A and B) waited for each other at the mall yesterday.

Also, if there is a frequency adverb such as *always* in the sentence, the situation may be different, too. For example, (ii) cannot be satisfied if A waits for B every time.

(ii) We always wait for each other.

Since the interaction among reciprocal situations, frequency adverbs and temproal relations is beyond the scope of this study, I will leave it for future research.

[10] It is interesting to note that in English *pile up* and *stack* are used as in *pile up on top of* and *stack on top of*, in which a direction is explicitly expressed. In Taiwanese, there is no direction incorporated explicitly in *xiou-tah* 'REC-pile'. But implicitly, a direction like that in English is incorporated, as shown in (i). (*Ga* in (i) is like *ba* in the *ba* construction in Mandarin. See Li (1994) for details.)

i) a. Ga hi-de pan-a tah e ji-de pan-a ding-tao.
GA that-CL dish pile on this-CL dish top-head
'Put that dish on top of this one.'
b. *Ga hi-de pan-a tah e ji-de pan-a e-tao.
GA that-CL dish pile on this-CL dish down-head
'Put that dish underneath this one.'

Similarly, *xiou-de* 'REC-follow' in Taiwanese is like *follow each other* in English in that a direction is incorporated. But in Taiwanese, there is no counterpart of *precede each other*, which is not an acceptable usage in English, either. Maybe there is some universal constraint on spatial and temporal relations of reciprocals, as noted by Langendoen (1978).

[11] The definition of 'Austinian proposition' according to Barwise (1989: 273)

is: '...for each situation s and each s-infon σ, there is a proposition p expressing the claim that $s \models \sigma$. This proposition is written: $(s \models \sigma)$. Call such a proposition an Austinian proposition.' Infons are objects which actual situations make factual and serve to characterize the intrinsic nature of a situation.

[12] For some symmetric stative predicates such as *similar*, (25) may be redundant.

[13] The specific condition for *xiou*-V_{wait} in (30) is still inadequate. I would like to leave it for future research.

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